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PACKAGING TUBE WITH DISPENSING MECHANISM FOR GRANULES OR SIMILAR PRODUCTS

The present invention relates to a packaging tube for granules or similar approximately spherical products, comprising a tubular body having one closed end and one open end, a removable stopper in the form of a cap closing the open end of the tubular body and a dispensing mechanism fitted in the open end of the tubular body and able to be activated manually to dispense the granules contained in the said packaging tube one by one.

Tubes of this type are used for example in the field of confectionery or in the field of pharmacy to package tablets, pastilles or granules, whether sugar-coated or not, and more generally any product which is in a spherical or approximately spherical form.

Tubes of the type defined above are already known, in which the dispensing mechanism consists of a sort of rotating barrel which the user has to turn so that one of the granules contained in the packaging tube, held vertically or approximately vertically with the stopper downwards, can pass by gravity into the barrel through a first opening and the granule thus selected (or any other granule selected by a previous rotation of the barrel) can be extracted from the packaging tube through a second opening which is offset angularly in relation to the first opening. The granules can thus be extracted one by one from the packaging tube and received directly in the user's hand if the stopper has been removed first. However, it is also possible to leave the stopper in place on the packaging tube while the granules are extracted one by one, so that the stopper can first serve as a receptacle to receive the granules extracted and then serve as a cup to consume the said granules.

The known packaging tubes with dispensing mechanism of the rotating barrel type are relatively complicated to use. In fact, in order to be able to activate the dispensing mechanism, the user has to use both hands, one to hold the packaging tube and the other to turn the barrel. In addition, as the angled position in which the barrel has to be stopped in order to be able to extract a granule after having turned the barrel one turn or a predetermined fraction of a turn is not defined or cannot easily be

discerned by the user, the result is that the latter has to proceed by trial and error every time to extract a granule and has to pay special attention to the number of turns or fractions of turns made to obtain the desired number of granules.

Moreover, in packaging tubes for granules arching phenomena sometimes occur, i. e. the granules in the lower part of the tube form a sort of arch by leaning one on top of the other, such that the granules can no longer penetrate into the dispensing mechanism, which makes it more difficult to extract them. Also, if the packaging tube contains sugar-coated granules or granules containing sugar, these granules are particularly sensitive to moisture. In this case, particular attention must be paid to the airtightness of the packaging tube, otherwise the granules could stick together and form clumps which would seriously impede extraction of the granules from the packaging tube.

Thus the purpose of the present invention is to provide a packaging tube for granules with a dispensing mechanism, which is much easier to use than the packaging tubes with a dispensing mechanism of the rotating barrel type.

Subsidiarily, the purpose of the present invention is to provide a packaging tube in which the dispensing mechanism works correctly even if arching phenomena occur or if the granules are lightly stuck to each other.

Subsidiarily, the purpose of the present invention is also to provide a packaging tube for granules, comprising a safety device to prevent children from being able to activate the dispensing mechanism.

To this effect, the packaging tube according to the invention is characterised in that the dispensing mechanism comprises a fixed partition which is fitted in the tubular body offset in relation to its open end and which is designed in such a way as to define a chute which extends obliquely in relation to the longitudinal axis of the tubular body towards the open end of the latter, and of which the cross-section is such that the granules to be extracted are arranged there in a single line, a sealing device which is fitted in the tubular body between the fixed partition and the stopper and which, in response to axial displacement of the stopper from a first position to a second position, is moveable axially from a first position in which it seals the outlet of the chute to a second position in which it frees the outlet of the chute to allow the granule at the head of the line in the chute to fall into the stopper by gravity, while

preventing the next granule from falling into the chute, and a spring means of return to return the sealing device to its first position.

Thus, holding the packaging tube in just one hand, for example between two fingers, with the stopper downwards, the user simply has to exert on the stopper, for example using the thumb of the same hand, a pressure directed axially from bottom to top to release a granule which then falls into the stopper. In order to obtain several granules, it is sufficient for the user to press on the stopper the number of times equal to the desired number of granules. This can be done very simply and without the need for any particular attention on the part of the user, apart from counting the number of presses on the stopper. After obtaining the desired number of granules, the user can remove the stopper and use it as a cup to swallow the granules obtained, after which the stopper is replaced on the packaging tube. Thus the time during which the packaging tube is open can be kept to a minimum, in practice the time needed to remove the stopper, swallow the granules and replace the stopper. Consequently, when the packaging tube is used in a humid atmosphere, the time during which moisture can penetrate into the packaging tube is reduced to the minimum.

Preferably the sealing device is housed entirely in the tubular body of the packaging tube so that it cannot be activated directly by hand after the stopper has been removed. This reduces the risk of the dispensing mechanism being activated by young children. This is particularly advantageous when the packaging tube contains drugs or other products which it could be dangerous for children to consume. In this case, the stopper in the form of a cap can comprise, in its cavity, at least one projecting element suitable to come into contact with the sealing device in order to displace the latter axially from its first position to its second position, against the force of the spring means of return, when axial pressure is exerted on the stopper.

Preferably the sealing device comprises a certain number of tongues or fingers which extend parallel to the axis of the tubular body and which cross passage openings provided in the chute and in the fixed partition. One of these tongues or fingers serves to prevent or allow the passage of the first granule in the line into the stopper, depending on whether the sealing device is in its first or second position. Another of the said tongues or fingers serves to hold back the next granule while the first falls into the stopper. Also, when the sealing device is displaced from its first position into its second position, the tongues or fingers penetrate into the internal

space of the chute and into the internal space of the tubular body situated the other side of the fixed partition in order to stir the granules housed there. This has the effect of eliminating any arching phenomena and of separating any granules which may have become stuck to each other.

Preferably the tubular body and the stopper comprise, as a safety device, male and female parts which are arranged so that they can engage with each other and allow axial displacement of the stopper from its first position to its second position when the stopper is in a predetermined angled position in relation to the tubular body, and which prevent the said axial displacement of the stopper from its first position to its second position if the stopper is in an angled position different from the said predetermined angled position. Thus the stopper first has to be moved into this predetermined angled position before it can be pushed axially into its second position to activate the distribution mechanism.

According to one embodiment of the invention, the stopper and the tubular body can have a non-circular transverse section inside and outside which has at least two axes of symmetry, such that the stopper can be placed on the tubular body in at least two different angled positions. One of the two angled positions corresponds to the said predetermined angled position, and the other angled position is a safety position. Thus, when the stopper is in its safety position, in order to activate the dispensing mechanism, it is necessary first to remove the stopper, then turn it through an angle corresponding to the difference in angle between the safety position and the predetermined angled position, and finally to re-engage the stopper on the tubular body, in the predetermined angled position, until the stopper achieves its first axial position. Then the dispensing mechanism can be activated by exerting pressure on the stopper as described above.

According to another embodiment of the invention, the tubular body can have, in the region adjacent to its open end, a cylindrical external surface on which there is at least one longitudinal rib as the male part of the safety device. In this case, the stopper in the form of a cap can have a cylindrical internal surface on which there are at least two longitudinal grooves of different lengths and different angled positions as the female parts of the safety device. One of the two angled positions corresponds to the said predetermined angled position of the stopper, while the other angled position corresponds to the said safety position of the stopper. A first groove in the stopper, the

shorter of the two grooves, has a length such that, when it is aligned with the longitudinal rib of the tubular body and this rib is engaged longitudinally right to the bottom of the first groove, the stopper is in its first axial position and cannot be displaced towards its second axial position. This situation corresponds to the safety situation in which the dispensing mechanism cannot be activated. The second groove in the stopper, the longer of the two grooves, has a length at least equal to the length of the first groove plus the length of the travel of the stopper between its first and second axial positions. Thus when the second groove is aligned with the longitudinal rib of the tubular body and this rib is engaged longitudinally into this second groove, the stopper can be displaced to its second axial position to activate the dispensing mechanism.

Preferably, in the second embodiment, the stopper has an external peripheral surface with a square cross-section, like the external peripheral surface of the tubular body with the exception of the region adjacent to its open end which has a cylindrical external surface. In this case, the said longitudinal rib and the first longitudinal groove can advantageously be formed respectively on the cylindrical external surface of the tubular body and in the cylindrical internal surface of the stopper in angled positions such that, when the said rib is engaged longitudinally in the first groove, the four sides of the external peripheral surface of the stopper are aligned respectively with the four sides of the part of the tubular body which has an external surface with a square cross-section. The second groove can be formed in a position displaced by an angle of 45° in relation to the first groove, such that when the said rib is engaged in the second groove, the four sides of the stopper are correspondingly offset in relation to the four sides of the part of the tubular body with a square cross-section. Thus the user of the packaging tube will know immediately whether the stopper is in the safety position (sides aligned) or in the predetermined position (sides offset) allowing activation of the dispensing mechanism.

Other characteristics and advantages of the present invention will become clear from the following description of two embodiments of the invention given as examples with reference to the appended drawings in which :

- figure 1 is a perspective view showing a packaging tube according to a first embodiment of the invention, with its stopper pointing downwards and placed in a first angled position or safety position in relation to the body of the tube;

- figure 2 is an exploded perspective view of the packaging tube in figure 1, with the stopper represented in a second angled position in relation to the body of the tube;
- figure 3 is a perspective view of a sealing device forming part of the dispensing mechanism of the packaging tube in figures 1 and 2;
- figure 4 is a view in longitudinal section of the packaging tube in figure 1, with the bottom of the body of the tube removed to allow the tube to be filled with granules;
- figure 5 is a view in longitudinal section similar to figure 4 after the packaging tube has been filled with granules and the bottom has been sealed on to the body of the tube, with the stopper represented in the safety position;
- figures 6 and 7 are partial views in longitudinal section illustrating the operations to be carried out to move the stopper of the tube from its first angled position or safety position shown in figure 5 to its second angled position (figure 7) in which the dispensing mechanism of the packaging tube can be activated;
- figure 8 is a partial view in longitudinal section similar to figure 7, showing the stopper of the packaging tube and the sealing device of the dispensing mechanism in the position where a granule contained in the tube is released and falls into the stopper, while the next granule is held back by the dispensing mechanism;
- figure 9 is an exploded perspective view showing a packaging tube according to a second embodiment of the invention;
- figure 10 is a view in perspective and longitudinal section of the packaging tube in figure 9, represented on a larger scale, with the elements of the tube assembled and the stopper being represented in its first angled position or safety position;
- figure 11 is a partial view in longitudinal section of the packaging tube in figure 10, with the stopper represented in its second angled position in which the dispensing mechanism of the packaging tube can be activated;
- figure 12 is a view similar to figure 11, in which the stopper and the sealing device of the dispensing mechanism are represented in a position in which a granule contained in the tube is released and falls into the stopper while the next granule is held back by the dispensing mechanism.

The packaging tube 1 represented upside down in figures 1 to 8 comprises a tubular body 2, one of the ends of which (the upper end in figures 1, 2 and 5), when in

service, is hermetically sealed by a bottom piece 3 which is sealed to the tubular body 2, for example by ultrasonic sealing, after the tube 1 has been filled with granules. The other end 4 of the tubular body 2 is open and can be sealed by a removable stopper or lid 5 in the shape of a cap. The tubular body 2, the bottom piece 3 and the stopper 5 can be made of a plastic material, such as polypropylene for example.

Inside of the tubular body 2 there is a dispensing mechanism 6 (figures 4 to 8) making it possible to distribute one by one the granules 7 contained in the tubular body 2 and having a spherical or approximately spherical shape. The dispensing mechanism 6 essentially consists of a partition 8 which is fixed in relation to the tubular body 2 and comprises an outlet passage for the granules 7, and of a sealing device 9 (see also figure 3) which is mounted so that it slides into the tubular body 2 so that it can slide axially within the latter in response to an axial displacement of the stopper 5 in relation to the tubular body 2.

The partition 8, which can be formed in one piece with the tubular body 2, is designed so that it defines a chute 11 which extends obliquely in relation to the longitudinal axis 12 of the tubular body towards the open end 4 of the latter. The chute 11 has a cross-section which is just slightly larger than the section of the granules 7 to be extracted, so that the granules can only enter the chute in single file. Preferably the partition 8 is shaped like the trunk of a cone, with a conical wall which tapers towards the open end 4 of the tubular body and a small base 8a which comprises an opening 13 forming an entry opening for the chute 11. The entry opening 13 is off-centre in relation to the axis 12 of the tubular body 2. The base 11a of the chute 11 is inclined and extends in the prolongation of a part of the conical wall of the partition 8. The outlet opening 14 of the chute 11 is situated approximately in a plane containing the axis 12 of the tubular body 2.

As shown in figures 3 to 8, the sealing device 9 can be made up of a hollow body 15, the shape and dimensions of which are such that its peripheral wall is in sliding contact with the internal peripheral wall of the tubular body 2. The body 15 comprises a back wall 15a which has an opening 16 through which each granule 7 which is extracted from the tubular body 2 by the dispensing mechanism 6 in a manner which will be described below, can pass in order to fall into the stopper 5.

The hollow body 15 comprises two tongues 17 and 18 which extend in parallel to the axial plane containing the outlet opening 14 of the chute 11, respectively on

either side of this axial plane and more or less at equal distances from it. The distance between the two tongues 17 and 18 corresponds to the diameter of a granule 7, preferably very slightly larger than this diameter, and they extend from the back wall 15a of the hollow body 15 into the passage openings 19 and 21 which are formed respectively in the small base 8a of the partition 8 and in the bottom 11a of the chute 11. In the tongue 17 there is a slit 22 with a width corresponding to the diameter of a granule 7, preferably very slightly larger than this diameter, which communicates with the opening 16 situated in the back wall 15a of the hollow body 15.

When the sealing device 9 is in a first position or resting position (figures 4, 5 and 7), the tongue 17 seals at least half of the outlet opening 14 of the chute 11 in order to prevent the granules 7 from falling into the stopper 5. The length of the second tongue 18 is such that, when the sealing device 6 is in the resting position, the free upper end of this tongue, which is bevelled, is approximately flush with the inclined bottom 11a of the chute 11.

When the sealing device 9 is in a second position or dispensing position (figure 8), the tongue frees, by means of its slit 22, the outlet opening 14 of the chute 11. Thus, the first granule 7a, i.e. the one which is the lowest and at the head of the line in the chute 11, can fall through the outlet opening 14, the slit 22 and the opening 16 into the stopper 5. While the sealing device 9 is passing from its first position to its second position, the upper end of the tongue 18 protrudes into the chute 11 and pushes the second or next granule 7b back upwards in order to withhold it.

A spring means of return is provided to return the sealing device 9 to its first position. Preferably, the spring means of return is made up of at least one elastic tongue, for example two elastic tongues 23 which are formed in one piece with the hollow body 15 of the sealing device 9 (figure 3). In this case the sealing device 9 can, for example, be made of a plastic material capable of having a spring effect, for example a polyoxymethylene (POM). Each of the two elastic tongues 23 extends from the upper edge of the peripheral wall of the hollow body 15, firstly vertically and then in the form of a curved ramp, in the direction of the partition 8, on the lower side of which it rests.

The hollow body 15 of the sealing device 9 also comprises two other tongues 24 which extend along the internal wall of the tubular body 2, in parallel to the axis 12 thereof, from the upper edge of the peripheral wall of the hollow body 15.

Each of the two tongues 24 passes through a respective passage opening 25 provided in the partition 8 and comprises, in the region of its free end which protrudes beyond the partition 8, a pin 26 which grips behind the edge of the respective passage opening 25 when the sealing device 9 is in its first position, as shown in figures 4 to 7. Thus, after the sealing device 9 has been put in place in the tubular body 2, the tongues 24 and their pins 26 limit the travel of the sealing device 9 when it is returned to its first position by the elastic tongues 23. In addition, the tongues 24 and their pins 26 prevent, or at least make difficult, extraction of the sealing device 9 from the tubular body 2 after it has been put in place therein.

When the sealing device 9 is moved from its first position (figure 7) to its second position (figure 8), the free ends of the tongues 17, 18 and 24 penetrate further inside the tubular body 2 in the direction of its closed upper end. Consequently, the tongues 17, 18 and 24 stir the granules 7 contained in the tubular body 2. This makes it possible to eliminate any adherence phenomena which might have occurred between the granules 7 between uses of the packaging tube, and to avoid any arching phenomena which might have occurred after each activation of the sealing device 9.

Preferably the stopper 5 is shaped and sized so that it surrounds and can slide on the external peripheral surface of the tubular body 2, in the region of its open end 4, although in other embodiments of the invention, the stopper 5 could be shaped and sized so that it can slide inside the tubular body 2. To allow activation of the dispensing mechanism 6, more precisely of the sealing device 9 thereof, the stopper 5 has in its cavity at least one protruding element suitable to come into contact with the sealing device 9 and to push it axially from its resting position to its dispensing position, against the return force of the elastic tongues 23, when axial pressure is exerted in the direction of the arrow F (figure 8) on the stopper 5 to move it from the position shown in figure 7 to the position shown in figure 8. As shown in figures 4 to 8, the stopper 5 can comprise, as a protruding element, four fingers 27 which extend from the back wall 5a of the stopper 5 to close to the back wall 15a of the hollow body 15 of the sealing device 9 when the stopper is in the position shown in figure 7 and the sealing device is in its resting position.

If the packaging tube 1 is intended to contain granules, uncontrolled consumption of which could be dangerous for children, for example homeopathic granules or allopathic granules, a certain number of safety measures can be taken so

that the dispensing mechanism 6 of the packaging tube cannot easily be activated by children. To this effect, the partition 8 is preferably formed inside the tubular body 2 at a distance from the open end 4 thereof such that the sealing device 9 is entirely housed inside the tubular body when in its resting position. In these conditions, if the stopper 5 is removed, the sealing device 9 does not protrude outside the tubular body 2 and it is therefore difficult to activate it by hand. In fact, packaging tubes for homeopathic granules are generally of small dimensions and it is difficult to put a finger into the open end 4 of the tubular body 2.

Another safety measure consists of fitting the tubular body 2 and the stopper 5 with at least one male part and at least one female part which are arranged so that they can engage with each other and allow axial displacement of the stopper 5 from the position shown in figure 7 to the position shown in figure 8 only when the stopper 5 is in a predetermined angled position in relation to the tubular body 2. In the embodiment in figures 1 to 8, the stopper 5 comprises, as the male part, at least one boss 28, for example two bosses 28 which protrude on its internal peripheral wall in diametrically opposite positions. In this case the tubular body 2 comprises, as the female part, at least one notch 29, for example two notches 29, which are formed in the edge of its open end 4, in diametrically opposite positions. Each of the notches 29 is designed so that it can receive one of the two bosses 28 when the stopper 5 is placed in the said predetermined angled position in relation to the tubular body 2, i.e. the bosses 28 are aligned respectively with the notches 29. The depth of the notches 29 is at least equal to the travel of the stopper 5 necessary to push the sealing device 9 from its resting position (figure 7) to its dispensing position (figure 8).

Thus when the stopper 5 is placed in an angled position different from the above-mentioned predetermined angled position, i.e. in a safety position like that shown in figure 5, the two bosses 28 abut the edge of the open end 4 of the tubular body 2 and prevent any axial movement of the stopper 5 in the direction of the sealing device 9. Therefore in this safety position, the dispensing mechanism 6 cannot be activated.

Marks can be provided on the stopper 5 and on the tubular body 2 to indicate the predetermined angled position in which the dispensing mechanism 6 can be activated, and/or to indicate the safety position in which the dispensing mechanism cannot be activated, so that the user of the tube 1 can easily determine which position

the stopper 5 is in and put it in the desired position before and after each use of the tube. For example, as shown in figures 1 and 2, the above-mentioned marks can consist of signs 31 and 32, for example triangular in shape, which can be formed for example by moulding, engraving or printing on the stopper 5 and on the tubular body 2, possibly in a different colour from that of these elements. In the example represented, the signs 31 and 32 are arranged to correspond respectively with the bosses 28 and the notches 29. In these conditions, in order for the dispensing mechanism 6 to be activated, the stopper 5 must be placed on the tubular body 2 in a position such that the signs 31 and 32 are aligned. Conversely, if the signs 31 and 32 are not aligned, the user knows that the stopper 5 is in the safety position.

If the packaging tube has a tamperproof label or strip 33 (represented by dot-and-dash lines in figures 1 and 2) which is affixed to both the stopper 5 and the tubular body 2 and has to be broken before the packaging tube 1 is first used, the above-mentioned marks can consist of the label or strip 33 itself. The strip 33 can be fixed to the tubular body 2 and the stopper 5 when the latter is in the safety position. In this case, after the strip 33 has been broken and after each use of the packaging tube, the user can easily distinguish whether the stopper 5 is in the safety position or in the predetermined position allowing dispensing of the granules, depending on whether the two parts 33a and 33b of the strip 33 are aligned or not, respectively.

Of course the packaging tube 1 can be fitted with both the marks 31 and 32 and the strip 33, with the alignment of the marks 31 and 32 making it possible to indicate for example the predetermined position with allows dispensing of the granules, while the alignment of the two parts 33a and 33b of the strip 33 makes it possible to indicate, for example, the safety position of the stopper 5.

Although the tubular body 2 and the stopper 5 of the packaging tube could both have a cylindrical shape, they preferably have a non-circular cross-section which has at least two axes of symmetry, for example a square cross-section with rounded corners as shown in figures 1 and 2. Thanks to this section of non-circular shape, the actions to be carried out in order to be able to activate the dispensing mechanism 6 are made more complicated for children. In fact, starting from the safety position of the stopper 5 (figures 1 and 5), first the stopper 5 has to be removed, then it has to be turned through 90 degrees, and finally it has to be re-engaged on the tubular body 2 as illustrated by the arrows in figure 6, in order to bring the stopper 5 into the position

shown in figure 7. It is only after these actions have been carried out that the stopper 5 can be pressed to activate the dispensing mechanism 6 as shown in figure 8.

If the granules 7 contained in the packaging tube 1 are sensitive to air or to the moisture present in the air, a means of airtightness can advantageously be provided between the stopper 5 and the tubular body 2. To this effect the tubular body 2 can comprise two spaced annular flanges 34 and 35 which protrude on its external peripheral surface and house between them an annular groove 36, and the stopper 5 can comprise an annular flange 37 which protrudes inside its cavity, as shown in figures 2 and 6. The annular flange 37 can be made of an elastomer material or a plastic material which is softer than that of the stopper 5, and it can be made in one piece with the latter, for example by a bi-injection moulding process. The flanges 34 and 35 and the flange 37 are formed respectively on the external peripheral surface of the tubular body 2 and on the internal peripheral surface of the stopper 5 in positions such that the flange 37 engages tightly in the groove 36 when the stopper 5 is in the safety position (figure 4 or 5) or in the position in figure 7 corresponding to the resting position of the sealing device 9. The extent to which the flange 35 protrudes radially on the external peripheral surface of the tubular body 2 and/or the extent to which the flange 37 protrudes radially on the internal peripheral surface of the stopper 5 and/or the hardness of the material of the flange 37 are chosen such that, when the stopper 5 is in the position shown in figure 7 and pressure is exerted on it in the direction of the arrow F, the flange 37 can clear the flange 35 without the need for excessive force to be exerted on the stopper 5, and the flange 37 can then slide on the external peripheral surface of the tubular body 2 practically without friction, so that it does not interfere with the activation of the dispensing mechanism 6.

A second embodiment of the invention will now be described with reference to figures 9 to 12. In these figures the elements which are identical to or play the same role as those in the first embodiment are identified by the same reference numbers and therefore will not be described again in detail. Therefore it will only be shown in what way the second embodiment differs from the first.

As shown in figure 10, the partition 8 is here essentially flat and perpendicular to the longitudinal axis of the packaging tube 1. On the internal peripheral surface of the tubular body 2 and on the upper surface of the partition 8 there are several ribs 41,

triangular or trapezoid in shape, which converge towards the inlet opening 13 of the chute 11 in order to guide the granules 7 towards this inlet opening.

The tongue 17 of the sealing device 9 is formed here in one piece with one of the two tongues 24, in the upper part of the latter. The tongue 17 is in the form of a longitudinal rib which extends downwards from the upper end of the tongue 24 over part of the length of the latter. The longitudinal tongue or rib 17 has a predetermined length, such that when the sealing device 9 is in its resting position (figure 11), the distance d_1 between the lower edge of the rib 17 and the lower edge of the outlet opening 14 of the chute 11 is smaller than the diameter of the granules 7 contained in the packaging tube, in order to prevent the granules from falling into the stopper 5. On the other hand, when the sealing device 9 is in its dispensing position (figure 12), the distance d_2 between the lower edge of the rib 17 and the lower edge of the outlet opening 14 of the chute 11 is larger than the diameter of the granules 7, so that the granule 7a, which is at the head of the line in the chute 11, can fall into the stopper 5 through the hollow body 15 of the sealing device 9 which here has no back wall. The upper end of the rib 17 is preferably bevelled in order to guide the granules 7 towards the inlet opening 13 of the chute 11. In addition, thanks to its bevelled end, the rib 17 is also more effective, when the sealing device 9 is moved from its resting position to its dispensing position, in preventing any arching phenomena of the granules or in detaching granules which may have become stuck to each other.

In the same way, the tongue 18 of the sealing device 9 is formed here in one piece with the other tongue 24 and is also in the form of a longitudinal rib which extends over part of the length of this other tongue 24. The upper end of the tongue or longitudinal rib 18 is bevelled so that, when the sealing device 9 is in its resting position (figure 11), the upper end of the rib 18 is flush with the upper surface of the back wall 11a of the chute 11. When the sealing device 9 is in its dispensing position (figure 12), the distance d_3 between the lower edge of the inlet opening 13 of the chute 11 and the upper edge of the longitudinal rib 18 is smaller than the diameter of the granules 7. Thus the granule 7b which is immediately behind granule 7a in the chute 11 is held back in the latter and cannot fall into the stopper 5 at the same time as the granule 7a.

On figure 11, two granules 7a and 7b of minimum diameter, i.e. granules with a diameter below which there is a risk of two granules being able to fall into the

stopper 5 every time the dispensing mechanism 6 is activated, are represented with solid lines. In figure 11 a granule 7 with maximum diameter, i.e. the largest granule which can pass through the dispensing mechanism 6 when the latter is activated, is represented by dot-and-dash lines. In figures 11 and 12 where the packaging tube is represented approximately at a scale of 4, the minimum and maximum diameters of the granules 7 are about 3.8 and 4.8 mm respectively. However, it goes without saying that the invention is in no way limited to these particular values, but these values can vary, designing the ribs 17 and 18 and the openings 13 and 14 with appropriate dimensions.

In the second embodiment of the invention, the tubular body 2 has in the region of its open end 4 a cylindrical external surface 2a, as is particularly visible in figure 9, while the stopper 5 has a cylindrical internal surface 5b with a diameter just slightly larger than that of the cylindrical part 2a of the body 2. The male and female parts of the safety device, which prevent or allow activation of the dispensing mechanism 6 depending on the angular position of the stopper 5 in relation to the tubular body 2, are created as follows. At least one longitudinal rib 28, for example four longitudinal ribs 28, are formed as the male parts of the safety device on the cylindrical external surface 2a of the body 2 in positions spaced at 90 degrees from each other. At least one pair of longitudinal grooves 29 and 42, for example four pairs of longitudinal grooves 29 and 42, are formed as the female parts of the safety device in the cylindrical internal surface of the stopper 5 as shown in figure 9. The four grooves 29 are formed in angled positions spaced at 90 degrees from each other. In the same way, the four grooves 42 are spaced at 90 degrees from each other and at 45 degrees from the grooves 29. The grooves 42 are shorter than the grooves 29 and have a length such that when the four grooves 42 are aligned respectively with the four longitudinal ribs 28 of the tubular body 2 and the stopper 5 is slid axially on the cylindrical external surface 2a of the body 2 in the direction of the sealing device 9, the ends of the ribs 18 come into contact with the edge of the grooves 42 just before or just at the moment when the cylindrical part 27 which protrudes on the back wall 5a of the stopper 5 comes into contact with the lower end of the hollow body 15 of the sealing device 9. This situation is shown in figure 10 and corresponds to the safety position of the stopper 5, in which the dispensing mechanism 6 cannot be activated.

The other four grooves 29 of the stopper have a length at least equal to the length of the grooves 42 plus the length of travel of the stopper 5 and the sealing device 6 [sic] from their resting position (figure 11) to their dispensing position (figure 12). Thus, when the four ribs 28 of the body 2 are aligned respectively with the four grooves 29 of the stopper 5 and engaged longitudinally in these four grooves, the dispensing mechanism 6 can be activated by means of the stopper 5.

Preferably the lower ends of the ribs 28 are rounded and the edges of the grooves 29 and 42 are splayed in the direction of the peripheral edge of the stopper 5 as shown in figure 9. Thus the four ribs 28 can be more easily engaged in the four grooves 29 or in the four grooves 42, even if the four grooves are not perfectly aligned with the four ribs 28. In addition, the four ribs 28 are preferably shorter than the cylindrical part 2a of the body 2. In these conditions, in order to be able to move the stopper 5 from its safety position to the position in which the dispensing mechanism 6 can be activated, and vice versa, it is not necessary to remove the stopper 5 from the body 2 completely. It is sufficient to move the stopper 5 axially downwards to a sufficient extent to bring the ribs 28 out of one of the two groups of grooves 29 or 42, then to turn the stopper 5 about 45 degrees and then move it axially upwards in order to engage the ribs 28 in the other group of grooves 42 or 29. During the upwards movement of the stopper 5, the splayed edges of the grooves 29 or 42 will guide the ribs 28 right to the bottom of the said grooves. It is also possible to give the grooves 29 and 42 a splayed form over their whole length and for the splayed edges of two adjacent grooves 29 and 42 to be connected together by a rounded part slightly offset from the peripheral edge of the stopper 5. In this case, when the stopper 5 is turned, the edges of the grooves 29 and 42 act as cam surfaces which, by resting on the rounded ends of the ribs 28, force the stopper 5 to move axially downwards to bring the ribs 28 out of one of the two groups of grooves 29 or 42 until the ribs 28 cross the summit of the rounded parts between the grooves 29 and 42, after which the ribs 28 can be engaged in the other group of grooves 42 or 29 by exerting axial pressure on the stopper 5.

Preferably the stopper 5 has an external peripheral surface, the cross-section of which is not circular, for example square, the same as the external peripheral surface of the tubular body 2, with the exception of its cylindrical part 2a adjacent to its open end 4. In this case, the longitudinal ribs 28 and the grooves 42, which define the

safety position of the stopper 5, can advantageously be in angled positions such that when the stopper 5 is in its safety position, i.e. when the ribs 28 are engaged in the grooves 42, the four sides of the external peripheral surface of the stopper 5 are respectively aligned or coplanar with the four sides of the part of the tubular body 2 which has an external surface with a square cross-section. For example, as shown in figure 9, the ribs 28 and the grooves 42 can be in positions corresponding to the angles of the square section. In this case, the four grooves 29 are in positions corresponding to the middle of the four sides of the square cross-section. Thus the user of the packaging tube can see immediately whether the stopper is in its safety position (sides aligned) or in the position allowing activation of the dispensing mechanism 6 (sides offset). In the second embodiment of the invention, it is therefore possible to dispense with the marks 31 and 32 provided in the first embodiment.

In the second embodiment of the invention, the airtightness between the stopper 5 and the tubular body 2 can be achieved by means of two flanges 34 and 37, formed respectively on the cylindrical external surface 2a of the body 2, close to its open end 4, and on the cylindrical internal surface of the stopper 5. The flange 34 has an external diameter approximately the same as the internal diameter of the flange 37. The two flanges are in contact with each other when the stopper 5 is in its safety position (figure 10) or in the position in which the dispensing mechanism 6 can be activated (figure 11).

It goes without saying that the embodiments of the invention which have been described above are given purely as examples and in no way as limitations, and that numerous changes can easily be made by a person skilled in the art without going beyond the scope of the invention. Thus notably, as has already been indicated above, the tubular body 2 and the stopper 5 can have a circular cross-section. However, a non-circular cross-section, for example oval, triangular, square, pentagonal, etc. is preferable in that the packaging tube does not roll when placed on its side on a flat, horizontal support surface.

CLAIMS

1. Packaging tube for approximately spherical granules or similar products, comprising a tubular body (2) having one closed end and one open end (4), a removable stopper (5) in the form of a cap closing the open end of the tubular body, and a dispensing mechanism (6) fitted in the open end of the tubular body and which can be activated manually to dispense one by one the granules (7) contained in the said packaging tube (1), characterised in that the dispensing mechanism (6) comprises a fixed partition (8) which is fitted in the tubular body (2) offset in relation to its open end and which is designed in such a way as to define a chute (11) which extends obliquely in relation to the longitudinal axis (12) of the tubular body (2) towards the open end thereof, and with a cross-section such that the granules (7) to be extracted are arranged there in single file, a sealing device (9) which is fitted in the tubular body (2) between the fixed partition (8) and the stopper (5) and which, in response to an axial movement of the stopper (5) from a first position to a second position, is movable axially from a first position in which it seals an outlet opening (14) of the chute (11) to a second position in which it frees the outlet opening of the chute to enable the granule (7a) at the head of the line in the chute to fall into the stopper by gravity, while preventing the following granule (7b) from dropping into the chute, and a spring means of return (23) to push the sealing device (9) back into its first position.

2. Packaging tube according to claim 1, characterised in that the sealing device (9) is entirely housed in the tubular body (2), and in that the stopper (5) in the form of a cap comprises, in its cavity, at least one protruding element (27) suitable to come into contact with the said sealing device (9) to move the latter axially from its first position into its second position, against the force of the spring means of return (23) when axial pressure is exerted on the stopper (5).

3. Packaging tube according to claim 1 or 2, characterised in that the outlet opening (14) of the chute (11) is situated in an axial plane of the tubular body (2), while its inlet opening (13) is formed in the fixed partition (8) in a position which is off-centre in relation to the longitudinal axis (12) of the tubular body (2), and in that the sealing device (9) is made up of a hollow body (15) which has a peripheral wall in sliding contact with the internal peripheral wall of the tubular body (2) and which is fitted with a first tongue (17) and a second tongue (18) which extend in parallel to the

longitudinal axis of the body, respectively on either side of this axis, into the passage openings (19 and 21) provided respectively in the fixed partition (8) and in an inclined back wall (11a) of the chute (11), the first tongue (17) sealing the outlet opening (14) of the chute when the sealing device (9) is in its first position, and being designed to let the granule (7a) at the head of the line in the chute (11) pass when the sealing device (9) is in its second position, the second tongue (18) having a length such that its free end is approximately flush with the inclined back wall (11a) of the chute when the sealing device (9) is in its first position, and in that it protrudes inside the chute (11) to hold back the next granule (7b) when the sealing device is in its second position.

4. Packaging tube according to claim 3, characterised in that the sealing device (9) also comprises a third and fourth tongue (24) which extend along the internal wall of the tubular body (2) parallel to its axis (12), from the peripheral wall of the hollow body (15) of the sealing device (9) and pass through the passage openings (25) provided in the fixed partition (8), each of the third and fourth tongues (24) comprising in the region of its free end, which protrudes beyond the fixed partition (8), a pin (26) which grips behind the edge of the respective passage opening (25) when the sealing device (9) is in its first position.

5. Packaging tube according to claim 4, characterised in that when the sealing device (9) is moved from its first position to its second position, the free ends of the tongues (17, 24) which through the said passage openings penetrate inside the tubular body (2) in the direction of its closed end in order to stir the granules (7) located there.

6. Packaging tube according to claim 4 or 5, characterised in that the hollow body (15) of the sealing device (9) comprises a back wall (15a) fitted with an opening (16) allowing passage of an extracted granule (7a) into the stopper (5), in that the first and second tongues (17 and 18) extend from the back wall (15a) of the said hollow body (15) and are spaced apart at a distance corresponding to the diameter of a granule, and in that the first tongue (17) has a slit (22) which communicates with the said opening (16) in the back wall (15a) of the hollow body (15) and which corresponds in width to the diameter of a granule, in order to let the granule (7a) at the head of the line pass into the chute (11) when the sealing device (9) is in its second position.

7. Packaging tube according to claim 4 or 5, characterised in that the first and second tongues (17 and 18) are made up of ribs which are formed in one piece respectively with the third and fourth tongues (24) and which extend over part of the length of these third and fourth tongues, the first tongue (17) extending downwards from the region of the free end of the third tongue (24) to a point such that it seals at least the upper half of the outlet opening (14) of the chute (11) when the sealing device (9) is in its first position.

8. Packaging tube according to any one of claims 1 to 7, characterised in that the fixed partition (8) is in the shape of a cone trunk, with a conical wall which tapers towards the open end (4) of the tubular body (2) and a small base (8a) which comprises an opening (13) forming the said entry opening of the chute (11), the said inclined back wall (11a) of the chute (11) extending in the prolongation of a part of the conical wall of the partition (8).

9. Packaging tube according to any one of claims 1 to 7, characterised in that the fixed partition (8) is flat and perpendicular to the longitudinal axis (12) of the tubular body (2) and comprises an off-centre opening (13) forming the inlet opening of the chute (11), the inclined back wall (11a) of the chute being situated below the said opening (13), and in that ribs (41) of a triangular or trapezoidal shape are formed on the fixed partition (8) and converge towards the said opening (13).

10. Packaging tube according to any one of claims 1 to 9, characterised in that the spring means of return (23) is constituted by at least one elastic element arranged between the sealing device (9) and the fixed partition (8).

11. Packaging tube according to claim 3, characterised in that the spring means of return consists of two elastic tongues (23) which are formed in one piece with the hollow body (15) of the sealing device (9), extend from the peripheral wall of the said hollow body and rest elastically with their free end against the fixed partition (8).

12. Packaging tube according to any one of claims 1 to 11, characterised in that the tubular body (2) and the stopper (5) comprise, as a safety device, male and female parts (28, 29) which are arranged so that they can engage with each other and allow axial displacement of the stopper (5) from its first position to its second position when the stopper is in a predetermined angled position in relation to the tubular body (2), and which prevent the said axial displacement of the stopper from its first position

to its second position if the stopper is in an angled position different from the said predetermined angled position.

13. Packaging tube according to claim 12, characterised in that the stopper (5) in the form of a cap comprises, as the male part, at least one boss (28) protruding on its internal peripheral wall and in that the tubular body (2) comprises, as the female part, at least one notch (29) in the edge of its open end (4), the said notch (29) being suitable to receive the said boss (28) when the stopper (5) is in the said predetermined angled position and having a depth at least equal to the travel of the stopper and of the sealing device from their first position to their second position.

14. Packaging tube according to claim 12 or 13, characterised in that it comprises marks (31,32; 33a,33b) on the stopper (5) and on the tubular body (2) to indicate the said predetermined angled position and/or the said safety position.

15. Packaging tube according to any one of claims 12 to 14, characterised in that the stopper (5) and the tubular body (2) have a non-circular cross-section which has at least two axes of symmetry, such that the stopper can be placed on the tubular body in at least two different angled positions, one of the two angled positions corresponding to the said predetermined angled position, and the other angled position being the said safety position.

16. Packaging tube according to claim 12, characterised in that the tubular body (2) has, in the region (2a) which is adjacent to its open end (4) and which is surrounded by the stopper (5), an external cylindrical surface on which there is at least one longitudinal rib (28) as the male part of the safety device, and in that the stopper (5) has an internal cylindrical surface in which, as the female parts of the safety device, there are at least two longitudinal grooves (29 and 42) which have different lengths and different angled positions, a first (42) of the two grooves having a length such that, when the said longitudinal rib (28) of the tubular body is aligned and engaged longitudinally down to the bottom of the first groove, the stopper (5) is in its first axial position, the second (29) of the two grooves having a length at least equal to the length of the first groove plus the length of travel of the stopper (5) between its first and second axial positions, such that, when the said longitudinal rib (28) is aligned and engaged longitudinally in the second groove (29), the stopper (5) can be moved to its second axial position to activate the dispensing mechanism (6).

17. Packaging tube according to claim 16, characterised in that the stopper (5) has an external peripheral surface with a square cross-section, in that the tubular body (2) has an external peripheral surface with a square cross-section with the exception of its region (2a) adjacent to its open end (4) which is cylindrical, in that the said longitudinal rib (28) and the first groove (42) are arranged in angled positions such that, when they are engaged longitudinally with each other, the four sides of the external peripheral surface of the stopper (5) are aligned with the four sides of the external peripheral surface with a square cross-section of the tubular body (2), and in that the second groove (29) is arranged in a position displaced by an angle of 45° in relation to the first groove (42), such that when the said longitudinal rib (28) and the second groove (29) are engaged longitudinally with each other, the four sides of the stopper (5) are correspondingly offset in relation to the four sides of the tubular body (2).

18. Packaging tube according to any one of claims 1 to 17, characterised in that a means of airtightness is provided between the stopper (5) in the form of a cap and the tubular body (2).

19. Packaging tube according to claim 18, characterised in that the tubular body (2) is provided with two annular flanges (34 and 35) which protrude on its external peripheral surface and house between them an annular groove (36), and in that the stopper (5) comprises an annular flange (37) which protrudes inside its cavity, engages tightly in the said annular groove (36) when the stopper (5) is in its first position, and slides on the external peripheral surface of the tubular body (2) when the stopper is moved from its first position to its second position.

20. Packaging tube according to claim 18, characterised in that the tubular body (2) is provided with an annular flange (34) with protrudes on its external peripheral surface, in that the stopper (5) is provided with an annular flange (37) which protrudes on its internal peripheral surface and is in airtight contact with the annular flange (34) of the tubular body (2) when the stopper (5) is in its first axial position.